LCA in Eastern Europe

The Life Cycle Assessment Management Tool for Technologies in Eastern Europe: Why and How

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Abstract. The knowledge and use of western-based environmental management tools like LCA (life cycle assessment) in Eastern Europe is very low. Discussions about introducing environmental management systems and taking care of environmental consequences of producing processes are very relevant now in Eastern European countries that want to become members of the European Union and to introduce their goods onto the international market. In this paper, the problems connected to introducing LCA based environmental management systems and Eco-Labeling in Eastern European countries are described. The poor financial condition of national sciences in Estonia does not appear to be the main problem. A brief overview of the development and current status of LCA research in Denmark, Finland and Japan is presented. Solutions to current problems are discussed, and experiences gained during conducting LCA research on oil shale energy production in Estonia are presented.

Keywords: Eco-labeling; KCL-ECO; LCA; LCA in CEEC; LCA in Estonia

Introduction

Life cycle assessment (LCA) is useful in environmental management and provides an overview of the environmental impact of a product throughout its life cycle – from cradle to grave. The development of the LCA theory began in the 60s in the US, and its principles are now widely used for improving the environmental performance of various products throughout the world.

In the Central and Eastern European Countries (CEEC) a significant transformation of society is currently ongoing. During the last decade, industry has been restructured. Enterprises and industries from the CEEC would like to introduce their products and/or services to the European market; at the same time these countries have applied for European Union (EU) membership. With respect to achieving and attaining the requirements to achieve these two goals, the CEEC can be divided into groups. The first group (including Estonia) plans to be ready to join the EU by 2003. Harmonization of local legislation with EU regulations is currently ongoing in these countries. Meeting the EU regulations/standards with respect to Eco-Labeling and the application of ISO 14000 standard series could be two main means that spread the knowledge about and create an interest in LCA in the CEEC. The present situation with respect to the introduction LCA is just in its beginning stage in the CEEC, except with respect to the introduction of LCA in Poland [1].

Many countries throughout the world – Switzerland, The Netherlands, Germany, Scandinavian countries, UK, France, USA, Japan, etc. – have highly developed LCA communities. Below, a brief overview of the developing LCA in some countries that could be regarded while starting to apply LCA in an Eastern European country are presented.

1 Experiences on Introducing LCA in the Denmark and Finland

The environmental policy of Scandinavian countries have a strong influence on the development of environmental policy in Baltic countries as their legislation, acting principles and examples are well-known and accepted in Estonia, Latvia and Lithuania.

The Nordic region is among the leaders in the application and development of LCA methodology. The number of LCA studies conducted and the strategy of development in the region's different countries varies [2]. The LCA methodology and guidelines edited by the Nordic Council of Ministers [3-4] were the first descriptions of LCA methodology available in Estonia. At the same time there are some differences in the current level and application of LCA in the Scandinavian countries, despite a similar starting position, economical possibilities and industrial development. Below, main differences between the application of LCA in Denmark and Finland are discussed.

In **Denmark**, the Environmental Design of Industrial Products (EDIP) collaborative project between the Institute for Product Development, the Technical University of Denmark, five major Danish industrial companies and the Confederation of Danish Industries was maintained from 1991 – 1997 [5]. The EDIP project was sponsored by the Danish Environmental Protection Agency (DEPA). The project produced several methodical books on LCA methodology, a PC-tool (only the ß-version of the tool is currently available) and a database on essential materials and processes (in Danish), a report on the environmental improvement of products at the participating companies and a dissemination campaign. The materials and tools produced are widely used by industries for improving their products and at universities for teaching. The price of the PC-tool and database is relatively low and, hence, is available to small and startup companies. According to the Danish experience, the main enterprise's reasons to take undertake an LCA are today as follows (in order of importance) [6]:

1. Wish to be in the forefront of environmental management
2. Environmental advantages
3. Image/marketing
4. Demands from market and customers

5. Logical step after EMS (environmental management system)
6. Potential demands from authorities
7. Economy
8. Eco-labeling

Denmark is also actively spreading the gained environmental knowledge into Baltic countries. For instance, the first LCA project in Latvia was conducted by experts from Denmark in the second half of the 1990s [7]. In Estonia projects on establishing the environmental management systems in companies representing local industrial branches, like the chemical and forest products industry, are currently going on in co-operation with Danish experts.

The amount of LCA research undertaken in **Finland** is less than that undertaken in Denmark and Sweden. LCA practitioners themselves should collect data about chemicals from producers/suppliers, a national database is missing. At the same time, it was much easier to achieve the LCA information about their products from Finnish enterprises than about materials imported into Finland. For example, a large, worldwide known company from the US did not provide any information for the LCA study carried out in Finland referring to the confidentiality of its LCI (life cycle inventory)-type data.

The Finnish LCA PC-tool KCL – ECO (version 3.0 is currently available), that was created by The Finnish Pulp and Paper Research Institute, was developed originally for investigations in the pulp and paper industry, but has subsequently been found to be suitable for other applications. Besides Finland, KCL – ECO is also being used in Germany, France, Korea, and the US. It is expensive and therefore only affordable for larger Finnish companies. Under these circumstances, only the largest companies are able to use the highly developed LCA-method tools and create their own databases. The LCAs are conducted mainly by research institutions. A national LCA program and support policy does not exist.

2 LCA in Japan

The characteristics of the LCA activities in the Asian/Pacific Region are that the government plays an active role in the promotion and implementation of LCA activities and projects in most countries [8]. Japan is the most advanced country in the region with respect to LCA activities and development. The cooperation of the industries, government and academia has proven to be very important in advancing LCA activities there.

In Japan, for achieving sustainable development, it is considered that industry should adopt both LCA and EMS [9] and, hence, in 1998, 42% of the companies have stated in their ISO 14001 policy that LCA is to be used as part of the EMS. At the end of 1998, 1542 companies in Japan had obtained certification according to ISO 14001. EMS is widely used by all sizes of companies, while larger companies mainly use LCA. The companies require methodologies and procedures to achieve the Life Cycle Management approach. Thus, academia should address this topic in their curriculum.

At the same time, the Japan Environmental Association for Industry has initiated an ambitious five-year National LCA project. The project's goals are to develop a standardized LCA methodology for Japan, a LCA database, networking systems for LCA information, and applications of LCA in various fields such as industrial production, marketing, environmental administration, promotion and popularization.

3 Current Situation 'LCA in Estonia'

The first project that included LCA was started in 1997. During a two-year study performed by researchers in the Department of Environmental Engineering at Tallinn Technical University with support from the Estonian Science Foundation, a LCA inventory analysis (LCI) of a local oil-shale fueled power plant has been conducted [10] and some changes of the water management have been suggested [11]. The main problems experienced during conduction of the above-mentioned LCI were as follows:

1. Lack of practical experience – the project was based only on theoretical knowledge gained from books
2. Lack of an LCA PC-tool
3. Lack of a database on basic materials
4. Lack of data on industrial emissions, only a few emission types were monitored and recorded permanently
5. Lack of knowledge and poor understanding of LCA principles in organizations
6. Applying the LCA is considered to be a very hard and expensive task
7. Poor finances

Despite these problems, the investigation resulted in a proposal for diminishing the pollution load into the local water bodies. This could be achieved by connecting the water management systems of the oil-shale mine and the thermal power plant. The investigators further concluded that a more thorough LCA investigation of the Estonian oil-shale energy production system should be undertaken using LCA computer tools and databases available internationally. A brief overview of the applications and benefits of using LCA has been published in Estonian [12].

Until now Estonian companies have not carried out an LCA on any of their own products. Knowledge of ISO 14040 series is still low, as these relatively new standards are not yet officially accepted in Estonia. A positive sign is that Estonian companies have started to apply more of the ISO 9000 standards for Total Quality Management within the last years. At the same time, the popularity of the ISO 14000 series is rising, and applying both standards at the same time is relatively cheaper. Later on, continuing with the ISO 14040 series could be a quite logical step for companies already fulfilling ISO 14000. It is understood that ISO certificates provide an advantage for competing on the EU market.

The Estonian Ministry of Environment is working on establishing a system for giving the 'EU – flower', the common Eco-label of the EU, to products. According to EU regulations all member countries should have an Eco-labeling or-

ganization. The widely known awarding of the 'green' labels is based on LCA studies of product groups. Hence, public explanation, introduction and popularization of LCA principles should be undertaken within the following years. Expected results will be the growth of demands by consumers for products produced environmentally friendly and further measures in industries for improving the environmental performance of their products, and applying for and obtaining the Eco-label.

4 Recommendations and Conclusions

The brief examples presented above about applying LCA in Denmark, Finland and Japan appear to be very educating and could be summarized as follows:

1. It is useful to incorporate into national policy and support the generation of basic databases and PC tools for LCA as this will lead to spreading LCA principles, knowledge in society and make it possible to also practice LCA in smaller companies.
2. The state support ensures a quick and effective start of LCA activities.
3. Without state support, the LCA can remain as an exclusive hobby of some researchers for years. For organizing proper LCA work, the amount of practitioners should grow for the generation of basic databases, participation in international co-operation and organization of a critical review process.
4. The incorporation of LCA into the environmental management system is perspective also for enterprises in CEEC.
5. Co-operation projects with countries having experienced LCA practitioners and active participation in international LCA development is essential for achieving the newest information and development directions within the international LCA community.
6. From applying LCA principles in different countries, it is useful to study and learn, and to work out the most effective way for starting LCA activities in a particular country.

LCA is useful and should be used to improve the environmental performance of products also in CEEC. It is clear that there is a shortage of groups that are interested in LCA development and its advancement. There is a need to educate and raise the awareness of the top governmental and industrial officials, and academia, on LCA's benefits; only then can the situation for the establishment of multi-partnerships and institutional infrastructures for LCA activities exist.

A good means to explain and to disseminate information about LCA could be attained by implementing the Eco-labeling process. The formation of a national Organization for Eco-Labeling capable of awarding local producers Eco-labels, including the 'EU flower', should be formed and would be an indispensable element in the EU approximation process of CEEC. Furthermore, there are other good arguments to form such an organization as soon as possible.

Eco-labeling in general has proved to be an effective instrument to achieve environmental progress on terms that are appealing to companies and promoting public participation.

The planning and establishment of an organization today may benefit from the experiences and results already accomplished in other countries. At the same time, it is important to industries in the CEEC that their representation in the process of elaborating and deciding on new criteria is ensured through the formation of the national organizations.

The construction of relevant databases and using a PC tool are necessary for the efficient practice and promotion of LCA. Not only is data from local sources required, but it is also important to cooperate with LCA methodologists and practitioners from other countries in developing these databases. Participation in international LCA workgroups will be useful. Finally, LCA-principles should be incorporated into the university level education.

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